

I CLAIM:

1. An apparatus for reading a data storage medium, the data storage medium including a rectangular card body that has a surface formed with a data storage track having a plurality of parallel and equally spaced apart track sections that are stored with optically detectable information, said apparatus comprising:
 - 5 a housing;
 - 10 a carrier frame mounted movably in said housing and adapted to be loaded with the data storage medium thereon;
 - 15 a first driving unit mounted in said housing and associated operably with said carrier frame, said first driving unit being operable so as to drive said carrier frame to move back and forth between first and second limit positions along a first direction parallel to the track sections;
 - 20 an optical detecting unit mounted movably in said housing and adapted for reading the optically detectable information stored in one of the track sections when said carrier frame is moved by said first driving unit along the first direction;
 - 25 a second driving unit mounted in said housing and associated operably with said optical detector unit, said second driving unit being operable so as to drive said optical detecting unit to move along a second direction transverse to the first direction; and

a control unit mounted in said housing and coupled electrically to said first and second driving units and said optical detecting unit, said control unit controlling said first driving unit so as to enable said 5 first driving unit to drive said carrier frame to move back and forth between the first and second limit positions along the first direction, said control unit receiving the optically detectable information read by said optical detecting unit and activating said second driving unit to move said optical detecting unit by a predetermined distance along the second direction upon detection that said carrier frame has been moved by said first driving unit from one of the first and second limit positions to the other one of the first and second limit 10 positions.

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2. The apparatus as claimed in Claim 1, wherein the predetermined distance is equal to a distance between adjacent ones of the track sections such that, when said second driving unit is activated by said control unit, 20 said optical detecting unit is moved away from an initial one of the track sections and is brought into alignment with another one of the track sections adjacent to the initial one of the track sections.

3. The apparatus as claimed in Claim 1, wherein said 25 housing includes

a hollow base for housing said carrier frame, said first driving unit and said control unit therein, said

base having an open top end such that the data storage medium is adapted be disposed on and taken away from said carrier frame via said open top end, and

5 a cover connected pivotally to said base and operable so as to move between a closed position, where said cover closes said open top end of said base, and an opened position, where an angle is formed between said cover and said base, said cover having an inner surface formed with a receiving groove for receiving said optical detecting unit and said second driving unit.

10 4. The apparatus as claimed in Claim 3, further comprising a guide unit that is disposed in said base for guiding movement of said carrier frame along the first direction.

15 5. The apparatus as claimed in Claim 4, wherein said guide unit includes

20 a pair of parallel guide rods extending along the first direction and spaced apart from each other in the second direction, said carrier frame being disposed on said guide rods, and

25 a pair of mounting seats connected to said carrier frame and sleeved slidably and respectively on said guide rods such that said carrier frame is capable of sliding on said guide rods along the first direction.

6. The apparatus as claimed in Claim 5, wherein each of said mounting seats is mounted with a plurality of spring-loaded rolling balls that abut against the

respective one of said guide rods.

7. The apparatus as claimed in Claim 4, wherein said guide unit includes a pair of parallel guide blocks extending along the first direction and spaced apart
5 from each other in the second direction, each of said guide blocks being formed with a guide groove extending along the first direction, said carrier frame having opposite ends engaged slidably and respectively within said guide grooves in said guide blocks such that said carrier frame is capable of sliding between said guide
10 blocks along the first direction.

8. The apparatus as claimed in Claim 7, wherein each of said guide blocks is mounted with a plurality of spring-loaded rolling balls in said guide groove that abut against the respective one of said ends of said carrier frame.
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9. The apparatus as claimed in Claim 3, wherein said first driving unit includes
an elongated rack mounted on one side of said carrier
20 frame, which is parallel to the first direction, and
a gear meshing with said rack.

10. The apparatus as claimed in Claim 3, wherein said carrier frame has a bottom surface formed with a pivot post, and said first driving unit includes:
25 a bi-directional motor mounted in said base and disposed below said carrier frame, said bi-directional motor having a drive shaft extending along an axis that

is transverse to said bottom surface of said carrier frame;

5 a circular plate mounted on said drive shaft so as to rotate together therewith and disposed below said carrier frame, said plate being formed with a pivot post; and

10 a connecting rod disposed between said plate and said carrier frame and having opposite ends that are coupled pivotally to said pivot posts of said carrier frame and said plate, respectively;

15 said bi-directional motor being connected to and being controlled by said control unit such that rotation of said plate in clockwise and counterclockwise directions results in back and forth movement of said carrier frame between the first and second limit positions along the first direction.

20 11. The apparatus as claimed in Claim 3, wherein said carrier frame has a bottom surface formed with a circular recess that has an inner wall, and said first driving unit includes:

25 a bi-directional motor mounted in said base and disposed below said carrier frame, said bi-directional motor having a drive shaft extending along an axis that is transverse to said bottom surface of said carrier frame; and

an eccentric wheel mounted on said drive shaft, said eccentric wheel being received in said recess and

abutting against said inner wall of said recess, a largest distance between said drive shaft and a periphery of said eccentric wheel being longer than a radius of said circular recess;

5 said bi-directional motor being connected to and being controlled by said control unit such that rotation of said eccentric wheel in clockwise and counterclockwise directions results in back and forth movement of said carrier frame between the first and
10 second limit positions along the first direction.

12. The apparatus as claimed in Claim 3, wherein said carrier frame has opposite conductive surfaces and opposite sides in the second direction, said first driving unit including:

15 two pairs of elongated electromagnets extending along the first direction, each pair of which is disposed adjacent to a respective one of said sides of said carrier frame, said electromagnets in each pair being spaced apart from each other and being disposed above and below
20 said carrier frame;

25 said electromagnets being connected to and being controlled by said control unit so as to generate positive and negative magnetic fields in the first direction when excited such that said carrier frame is capable of moving back and forth between the first and second limit positions along the first direction.

13. The apparatus as claimed in Claim 3, wherein said

second driving unit includes

a bi-directional motor unit disposed in said cover and having a threaded guide shaft that extends in said receiving groove along a third direction parallel to said inner surface and transverse to the first direction, said optical detecting unit being sleeved threadedly on said threaded guide shaft,

said bi-directional motor unit being connected to and being controlled by said control unit so as to enable said threaded guide shaft to drive said optical detecting unit to move along the second direction when said cover is disposed in the closed position.

14. The apparatus as claimed in Claim 1, wherein said control unit is adapted to process the optically detectable information from said optical detecting unit and to provide the optically detectable information to an external processing unit.

15. The apparatus as claimed in Claim 14, further comprising a connector mounted on said housing, said connector being coupled electrically to said control unit and being adapted to be coupled electrically to the external processing unit for transmitting the optically detectable information to the external processing unit.

25 16. The apparatus as claimed in Claim 15, wherein said connector is one of a USB connector, a PCMCIA connector and an RS232 connector.

17. The apparatus as claimed in Claim 14, further comprising a frequency signal generator mounted on said housing and coupled electrically to said control unit for wirelessly transmitting the optically detectable information to the external processing unit.
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18. The apparatus as claimed in Claim 1, further comprising a power supply unit mounted detachably on said housing for providing electric power to said apparatus.
- 10 19. The apparatus as claimed in Claim 1, further comprising a display mounted on said housing and coupled electrically to said control unit.
20. The apparatus as claimed in Claim 3, further comprising a position detecting unit disposed in said base and coupled electrically to said control unit for detecting position of said carrier frame, said position detecting unit generating a signal to said control unit upon detection that said carrier frame has been moved to one of the first and second limit positions.
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- 20 21. The apparatus as claimed in Claim 20, wherein said position detecting unit includes
- a pair of light emitters mounted on a bottom surface of said carrier frame and spaced apart from each other in the first direction, and
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- a pair of light sensors mounted in said base and spaced apart from each other in the first direction, one of said light sensors, which is adjacent to the

first limit position, sensing light emitted by a corresponding one of said light emitters so as to generate the signal to said control unit when said carrier frame is moved to the first limit position,

5 one of said light sensors, which is adjacent to the second limit position, sensing light emitted by a corresponding one of said light emitters so as to generate the signal to said control unit when said carrier frame is moved to the second limit position.

10 22. A data storage medium for storing optically detectable information, comprising:

 a sector card body having a surface that is formed with a data storage track having a plurality of equally spaced apart curved track sections that are adapted to
15 be stored with the optically detectable information.

 23. An apparatus for reading a data storage medium, the data storage medium including a sector card body having a surface that is formed with a data storage track having a plurality of equally spaced apart curved track sections that are stored with optically detectable information,
20 said apparatus comprising:

 a housing;
 a pivot axle mounted rotatably in said housing and adapted to be sleeved with the data storage medium thereon such that the data storage medium is rotated
25 together with said pivot axle;

 a first driving unit mounted in said housing and

associated operably with said pivot axle, said first driving unit being operable so as to drive said pivot axle to rotate in clockwise and counterclockwise directions so as to drive the data storage medium to 5 rotate back and forth between first and second limit positions;

an optical detecting unit mounted movably in said housing and adapted for reading the optically detectable information stored in one of the curved track sections 10 when the data storage medium is rotated by said first driving unit;

a second driving unit mounted in said housing and associated operably with said optical detector unit, said second driving unit being operable so as to drive 15 said optical detecting unit to move along a radial direction relative to said pivot axle; and

a control unit mounted in said housing and coupled electrically to said first and second driving units and said optical detecting unit, said control unit controlling said first driving unit so as to enable said 20 first driving unit to drive the data storage medium to rotate back and forth between the first and second limit positions, said control unit receiving the optically detectable information read by said optical detecting unit and activating said second driving unit to move 25 said optical detecting unit by a predetermined distance along the radial direction upon detection that the data

storage medium has been moved by said first driving unit from one of the first and second limit positions to the other one of the first and second limit positions.

24. The apparatus as claimed in Claim 23, wherein the
5 predetermined distance is equal to a distance between adjacent ones of the curved track sections such that, when said second driving unit is activated by said control unit, said optical detecting unit is moved away from an initial one of the curved track sections and
10 is brought into alignment with another one of the curved track sections adjacent to the initial one of the curved track sections.

25. The apparatus as claimed in Claim 23, wherein said housing includes

15 a hollow base for housing said pivot axle, said first driving unit and said control unit therein, said base having an open top end such that the data storage medium is adapted be sleeved on and taken away from said pivot axle via said open top end, and

20 a cover connected pivotally to said base and operable so as to move between a closed position, where said cover closes said open top end of said base, and an opened position, where an angle is formed between said cover and said base, said cover having an inner surface formed
25 with a receiving groove for receiving said optical detecting unit and said second driving unit.

26. The apparatus as claimed in Claim 25, wherein said

first driving unit is a bi-directional motor mounted in said base and having a drive shaft that serves as said pivot axle.

27. The apparatus as claimed in Claim 25, wherein said
5 second driving unit includes

a bi-directional motor unit disposed in said cover and having a threaded guide shaft that extends in said receiving groove along a direction parallel to said inner surface, said optical detecting unit being sleeved threadedly on said threaded guide shaft,
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said bi-directional motor unit being connected to and being controlled by said control unit so as to enable said threaded guide shaft to drive said optical detecting unit to move along the radial direction when said cover
15 is disposed in the closed position.

28. The apparatus as claimed in Claim 23, wherein said control unit is adapted to process the optically detectable information from said optical detecting unit and to provide the optically detectable information to an external processing unit.
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29. The apparatus as claimed in Claim 28, further comprising a connector mounted on said housing, said connector being coupled electrically to said control unit and being adapted to be coupled electrically to the external processing unit for transmitting the optically detectable information to the external processing unit.
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30. The apparatus as claimed in Claim 29, wherein said connector is one of a USB connector, a PCMCIA connector and an RS232 connector.
- 5 31. The apparatus as claimed in Claim 28, further comprising a frequency signal generator mounted on said housing and coupled electrically to said control unit for wirelessly transmitting the optically detectable information to the external processing unit.
- 10 32. The apparatus as claimed in Claim 23, further comprising a power supply unit mounted detachably on said housing for providing electric power to said apparatus.
- 15 33. The apparatus as claimed in Claim 23, further comprising a display mounted on said housing and coupled electrically to said control unit.